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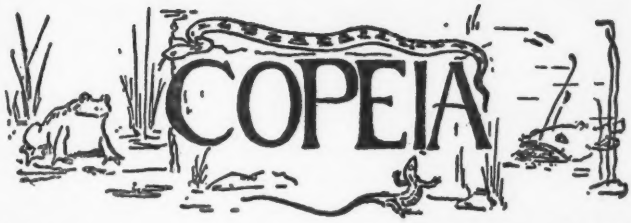

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To Advance the Science of Cold-blooded Vertebrates

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MELANISM AND COLOR CHANGES IN KILLIFISHES

IN the opening article in Copeia, No. 137, Mr. G. S. Myers calls attention to the remarkable melanic modification of certain killifishes. It may not be known to many that some killifishes at least possess very considerable powers of color change. For some years past *Fundulus heteroclitus* has been studied in our laboratories from this standpoint. Vigorous individuals of this species when placed in brightly illuminated white bowls soon assume a very light tint. If they are then transferred to a well lighted glass-vessel over a black background, they quickly turn quite dark. This condition may also be produced by etherization. When a few drops of ether are mixed with the water in a white bowl in which a light-colored fish is swimming, the fish rapidly assumes a dark tint. Fully etherized fishes are steel-blue. On transferring them to pure water with light surroundings they quickly recover and become light-colored again. The fishes undergo etherization well and may be made to shift back and forth repeatedly between the light and the dark conditions by transferring them from pure water to ether water

and back again. So extreme are these changes at times that one can scarcely believe that it is the same fish that is now light, now dark. If at any stage the fish is killed by immersing it in a solution of formaldehyde, or in alcohol, the tint is in the main preserved and permanent preparations may thus be made.

These changes are produced chiefly by the expansion and the contraction of microscopic pigment cells or melanophores located under the scales of Fundulus. The alterations in form of these melanophores during contraction and expansion have been beautifully figured by Spaeth (Jour. Experimental Zoology, Vol. 15). When the eyes of Fundulus are removed, the fish no longer responds to changes of tint in the surroundings by changes in its skin, thus showing that its melanophores are ordinarily under a form of nervous control in which the eyes play an essential part. It is a remarkable fact that when a normal vigorous Fundulus is put in the dark, it does not become dark-colored as it does when it sees much black about it, but it takes on a tint more nearly that of a fish on a light background. Hence seeing black and being in the dark are physiologically quite different states. This observation, which was made by Lanchner and myself (Amer. Jour. Physiology, vol. 61), confirms an earlier record by von Frisch on European fishes.

Not only does the nervous system influence profoundly the tint of Fundulus, but internal secretions and other like substances play a part in these changes. Wyman (Jour. Experimental Zoology, vol. 39), demonstrated that certain materials, such as adrenalin, when introduced into the blood of Fundulus caused its melanophores to contract while certain other substances, such as the narcotics, under like conditions caused them to expand. More recently Connolly (Biological Bulletin, vol, 47), has pointed out that when vigorous living specimens of Fundulus are kept continuously in a uniformly colored environment, they tend after a number of days to approximate the tone

of this environment. This occurs at least in red, in yellow, in green, and in blue surroundings. The blue tint in the fishes is due to numerous glistening bluish points exposed by a certain degree of contraction of the melanophores. The yellow is the result of an expansion of yellow cells in the fish's skin. The green results from a combined action of the yellow and blue factors. The red tint is due apparently to a congestion of the blood-vessels in the skin of the fish, a veritable blushing.

Although these color changes are not so striking as the changes from light to dark due to the melanophores, they are nevertheless unquestionable and show that *Fundulus heteroclitus* possesses in some small degree capabilities that are highly developed in such animals as the chameleon, and that from this standpoint the killifishes are worthy of careful study. This communication is written with the view of exciting the interest of those who have killifishes under observation that records may be made of the ability of these fishes to change their tints and that the range of the individual fish may be recorded.

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TRIDENTOPSIS PEARSONI
A NEW PYGIDIID CATFISH FROM BOLIVIA[1]

IN 1889 (Proc. California Acad. Sci., 2nd ser., II, pp. 53–54), Eigenmann and Eigenmann described the genus *Tridens*, based on *T. melanops* (the genotype), represented by 27 specimens from Içá, Amazons, in the Museum of Comparative Zoölogy, and on *T. brevis*, represented by a single specimen from Tabatinga. Nothing further has been contributed to our knowledge

1. Contribution from the Zoölogical Laboratory of Indiana University.

of these minute fishes excepting Dr. Eigenmann's redescription of a single one of the cotypes of *T. melanops* in his revision of the Pygidiidæ (Mem. Carnegie Mus., VII, 1918, pp. 369–370). The single type of *T. brevis* in the M. C. Z. has been lost.

This year Mr. N. E. Pearson (Indiana Univ. Stud., 64, 1924 (1925), pp. 17–18), reported 20 specimens of *Tridens brevis* from Lake Rogoagua, Bolivia. Examining Pearson's material I do not feel at all sure that his fish is specifically the same as *brevis*, all the specimens being considerably deeper.

In his "Pygidiidæ", Dr. Eigenmann expressed a doubt as to *Tridens brevis* being congeneric with *T. melanops*. On examination of Pearson's material (which is certainly congeneric, if not conspecific, with *brevis*) I feel justified in forming a new genus for *brevis* and Pearson's fish, which I provisionally recognize as a distinct species. New material from nearer the type locality of *brevis* will be needed to settle the specific identity.

Tridentopsis New genus

Genotype: *Tridentopsis pearsoni*.

Differing from *Tridens* in the much more compact form, in the greater number of opercular and preopercular spines, in the presence of a nasal barbel, and in the much greater development of the maxillary barbels.

Tridentopsis pearsoni New species

Tridens brevis Pearson (not of Eigenm. & Eigenm.), Indiana Univ. Stud., 64, 1924 (1925), p. 17.

Dorsal 7½. Anal 17½ to 19½. Depth 4.5 to 5.1 (6 in a nearly dry specimen) in length to caudal base. Head 5.8 to 6.5. Eye 2.8 to 3.2 in head. Anal inserted just before vertical of dorsal origin, or, in gravid females, directly below the dorsal origin. Dorsal inserted twice as far from snout tip as from caudal base. Pelvic fins well developed, composed of five soft rays, inserted midway between snout tip and

caudal base. Longest pectoral rays reaching a little more than half way from their base to the pelvics; the two first rays attenuated, twice (not "half again", as stated by Pearson), as long as the last ray. Caudal rather deeply emarginate, lobed, the upper lobe slightly longer.

Head depressed, flat, as broad as long;[2] eye 2.2 in interorbital. Fontanel large, kite-shaped, apex forward, width more than .33 width of head, length less than twice width. Nares widely separated, both longitudinally and across, a half orbit diameter between anterior and posterior. The anterior small, the flap produced into a nasal barbel nearly the length of the eye, the posterior larger with no barbel. Two maxillary barbels, the exterior one longer, reaching the edge of the opercular flap or the pectoral base.

From above, the head, with the bony framework of the pectoral system, which protrudes though covered with skin, is much wider than the rest of the body, which grows progressively more compressed posteriorly. The dorsum is practically straight to the dorsal fin, whence it slopes down to the caudal. The venter is rather deep, deepening to about the pelvic insertion, rounding toward the anus, and abruptly extending up at the anal base in a curve to the peduncle, which is not wide.

Branchiostegals 6. Gillrakers none. Opercle with a bunch of 10 strong, recurved spines. Preopercle with a bunch of 8 slightly weaker, recurved spines. Maxillary teeth in 3 slightly irregular, posteriorly directed rows, rather long and recurved-conical in shape.

Top of head and dorsum heavily dotted with dark brown chromatophores, especially before dorsal. A dark lateral streak of chromatophores from head to middle of caudal base. A heavy, wide band of dark chromatophores from pectoral to anus. This coloration is considerably faded in most of the specimens, but is evident to some extent in all.

2. Pearson says of the head, "Width equal to its depth." "Depth" should read "length".

The holotype (Indiana University Cat. Fish. No. 17664), measures 23 mm. to caudal base, 28 mm. total length. It is the largest specimen. The 19 paratypes (I. U. C. F. No. 17277), range down to 22 mm. total length. All are adults, from lagoons at Lake Rogoagua, Bolivia, collected by N. E. Pearson, while a member of the Mulford Biological Exploration of the Amazon Basin, in November 1921.

The above shows some discrepancies with Pearson's account. Except where the two descriptions do not agree, Pearson's may be utilized as supplementary to the above.

In the original description of the genus *Tridens* it is stated that the pelvics (ventrals) are nearer the snout than the caudal base. If this is true for *T. brevis*, described at the same time, then this forms a difference between it and *pearsoni*. No nasal barbels are mentioned for *brevis*. If they really are not present then this character must be removed from the generic diagnosis. The presence of a nasal barbel in *Tridens* and its absence in the unquestionably closely allied *Tridentopsis* shows that Dr. Eigenmann's major division of the Pygidiidæ on this character is artificial, the two genera falling into entirely different groups in the synopsis.

Tridentopsis brevis (Eigenmann and Eigenmann)

Differing from *T. pearsoni* in greater depth (8), in the absence of the dark lateral band from pectoral to anus, and possibly in the absence of a nasal barbel. The type and only known specimen now lost.

Tridens Eigenmann and Eigenmann

Extremely elongate (depth 13); opercular spines 3, preopercular spines 3; no nasal barbels; maxillary barbels minute, scarcely evident.

Tridens melanops Eigenmann and Eigenmann

Pelvics minute, nearer snout tip than caudal base. Dorsal inserted over middle of anal.

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NOTE ON ELAPHE SUBOCULARIS (BROWN)

A specimen of *Elaphe subocularis* (Brown) was recently submitted to me for identification by Mr. L. S. Frierson, Jr., from his private collection. This species has hitherto been known only from its type-locality, near the head of Toyah Creek, Jeff Davis county, about 50 miles southwest of Pecos, Texas. Its range is usually cited as "Davis Mountains, Texas."

The present specimen comes from McKilligon's Canyon, altitude about 4000 feet, Mt. Franklin, El Paso County, Texas, collected May 5, 1924 by Col. M. L. Crimmins, who has done much to further our knowledge of the snakes of western Texas. This record extends the range of the species about 125 miles to the northwest and makes it probable that this snake will be found in southern New Mexico as well as in trans-Pecos Texas.

The specimen is a juvenile female, total length 385 mm., tail 54 mm. The dorsal scales are in 33 rows on the neck, 33 at mid-body and 23 near the anus. The ventrals are 269, anal divided, subcaudals 73. The upper labials are 10, the lower labials 14. There are two preoculars, of which the lower is small, 2 suboculars and 2 postoculars. The temporals are 4–4 on each side, but a pair of small scales between the elongate temporals, the labials and the lower postocular on each side might be called temporals, in which case the temporal formular would be 5–4. A small additional scale is cut off from the fourth labial on each side, in contact with the third labial, the loreal and the two preoculars. A pair of short occipitals are cut off from the parietals by a straight transverse suture.

The coloration agrees very well with the original description. Head and venter are without markings. There are 28 dark H-shaped spots on the back, and eleven dark markings on the tail. The first five of these are connected, forming a pair of lines on the

neck, and the first two are recognizable only as slight expansions of these lines, not connected across the back. These lines are on the eleventh to thirteenth scale rows. Caudad the dark markings are shorter, more widely separated, and they may enclose a pair of light spots.

Brown records the ventrals and caudals of four specimens (1901, Proc. Acad. Nat. Sci. Phila., LIII, p. 494–495). The type has 270 ventrals and 70 caudals, thus agreeing closely with our specimen with 269–73. The three paratypes recorded by Brown had 240 to 245 ventrals and 63–77 caudals. There can be little doubt that these two ventral groups represent the sexes, and that there is no sex difference in the caudal count or proportionate tail-length in this species.

The evident relationship of this species with *Elaphe rosaliæ* (Mocquard) of central Lower California forms a satisfactory link in the chain of evidences I have brought forward for a divergent emigration of some of the Lower Californian and Mexican Plateau species from a center of reptilian evolution in the southwestern United States (Schmidt, 1922, Bull. Amer. Mus. Nat. Hist., XLVI, p. 628).

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